PATENT APPLICATION

of

Burton L. Hart
32 Antoinette Road
Auburn, Illinois 62615
Citizen of the United States of America,

and

John T. Knepler
2404 Hampshire Place
Springfield, Illinois 62707
Citizen of the United States of America

for

BEVERAGE SERVER

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BEVERAGE SERVER

CROSS REFERENCE

[0001] This application is a continuation-in-part of U.S. Serial No. 09/832,524, filed April 11, 2001 which is a divisional of U.S. Serial No. 09/558,076 filed April 25, 2000, which is a continuation-in-part of U.S. Serial No. 09/429,062 which is a continuation of U.S. Serial No. 09/057,463 filed April 8, 1998 which claims the benefit of U.S. Serial No. 60/044,627 filed April 18, 1997.

BACKGROUND

[0002] The present disclosure relates to beverage servers for retaining beverages at a desired heated temperature, to beverage servers for preventing the dispensing of beverage which is not fresh, to beverage servers for preventing overflow of brewed beverage, to beverage servers for preventing the combining of old beverage with new, to brewers for automatically brewing beverage when a liquid level in a server falls below a pre-determined level, and to brewing systems for preventing the dispensing of beverage from a brewer to a server when the server is not in position.

[0003] Prior art beverage servers have attempted to maintain the temperature of a brewed beverage retained therein in a variety of ways. One form of beverage server utilizes a heat resistant and heat conductive material for a beverage reservoir and places an exposed flame using a product such as gelled fuel thereunder to provide heat. One problem with this type of beverage server is that an exposed flame is presented to the customers and that the flame does not necessarily maintain a consistent or desired beverage temperature.

[0004] Another form of beverage dispenser which provides heat to a server is a warmer plate type device. The server is constructed of a material which will conduct heat from a warmer plate positioned therebelow. Heat is produced by the warmer plate, generally at a consistent power level. Typically, a glass, metal or ceramic reservoir is required in order to conduct heat to the beverage retained therein. This type of server provides heat to the beverage retained therein but also places an active heating element in a position which may be accessible to a user. Such an active heating element exposed to customers may be less than optimal.

[0005] Another way in which the prior art has attempted to maintain a brewed beverage in a heated condition and to present the beverage in a server for use by a consumer is the use of glass-insulated reservoirs and air pots. The glass insulated reservoirs provide

temperature retention and may be heated by a warming device as discussed above. However, such glass reservoirs are subject to damage upon impact. As such, it would be preferable to provide a non-breakable reservoir structure for such beverage servers especially because they are presented to customers for use and such consumers may be less than careful in using such servers.

[0006] The air pots mentioned above help to slow the loss of heat from beverage servers but generally are not used with an active heat maintaining system. Air pots typically use a glass reservoir and are subject to the problems discussed hereinabove with regard to glass reservoirs. Further, the air pots use a pressurization system in order to drive coffee through a dispensing tube in the reservoir. As such, atmosphere actively and intentionally introduced into the air pot reservoir. Generally, it is desirable to minimize the contact of atmosphere with coffee retained in a reservoir in order to improve and extend the flavor qualities of the coffee. Contact and exposure to air tend to reduce the flavor characteristics and degrade the coffee. As such, air pots actively introducing such air may tend to accelerate the flavor degradation.

[0007] As an additional matter, the prior art servers tend to quickly reduce the temperature of coffee when coffee is initially dispensed into a cool or unheated reservoir. As might be expected, heat from the coffee is conducted to the surrounding walls of the reservoir which thereby reduces the temperature of the beverage and reduces the time for retaining the beverage. While some reservoirs provide instructions to the food preparation employee to preheat a reservoir with heated water, the food preparation employees may forget or fail to preheat the reservoirs thereby creating the problems associated with cold reservoirs.

[0008] As might be expected with other foods, coffee as well as other brewed beverages have a "life" during which the flavor characteristics are optimal. Freshly brewed coffee, for example, sitting in an open pot will have a "life" of approximately 20-30 minutes. The life is extended by reducing the evaporative loss of the coffee, minimizing the atmospheric contact with the coffee, regulating the temperature conducted to the coffee to maintain the coffee at a desired serving temperature, preventing overcooking of the coffee, and maintaining the temperature at a desired temperature range. However, prior art devices tend to expose the coffee to the atmosphere, fail to regulate the temperature of the heat provided to maintain the coffee in a heated condition, and tend to "cook" the coffee such as by leaving the coffee on an unregulated warmer.

[0009] Additionally, some prior art beverage servers readily allow a consumer to dispense beverage from the server even though the beverage may have been sitting in the server a long time (i.e. even though the beverage is old).

[00010] Further, some prior art beverage servers do not prevent dispensing a brewed beverage from a brewer to a server even though the server at least partially full. This may cause the server to overflow. Moreover, some prior art servers do not prevent dispensing a brewed beverage from a brewer to a server even though there is some old beverage contained in the server. Hence, freshly brewed beverage is mixed with old beverage in the server.

[00011] Additionally, some prior art beverage servers do not provide that brewing is automatically initiated once the beverage retained in a server has diminished below a pre-determined level.

[00012] Still further, some prior art beverage serving systems provide that beverage can be dispensed from a brewer even though an associated server is not in position under the brewer. For the foregoing reasons, as well as other reasons which may not have been discussed hereinabove, there is a need for an improved beverage server which may be presented to customers for self-dispensing.

[00013] An object of an embodiment of the present invention is to provide a beverage server which is configured to prevent dispensing beverage which has become stale.

[00014] Another object of an embodiment of the present invention is to provide a brewer which is configured to dispense beverage to a server only if the beverage retained in the server has decreased to a pre-determined level.

[00015] Still another object of an embodiment of the present invention is to provide a brewer which is configured to automatically initiate a brewing cycle once the beverage retained in a server has diminished below a pre-determined level.

[00016] Still yet another object of an embodiment of the present invention is to provide a brewer which is configured to detect whether a server is in position relative to the brewer.

[00017] Briefly, the present disclosure provides a beverage server and a beverage server in combination with a beverage brewer. Contacts are provided between the brewer and server, and the server is conductively coupleable to and removable from the brewer. The server is configured to provide heat to a reservoir area in the server. The server can be heated in advance of dispensing beverage to the reservoir to reduce or prevent loss of heat from the beverage when it is dispensed into the reservoir.

BRIEF DESCRIPTION OF THE DRAWINGS

[00018] The organization and manner of the structure and function of the disclosure, together with the further objects and advantages thereof, may be understood by reference to the following description taken in connection with the accompanying drawings, wherein like reference numerals identify like elements, and in which:

[00019] FIG. 1 is a perspective view of a beverage server as disclosed positioned at a brewing apparatus which facilitates brewing of a coffee beverage or other infusion type brewed beverage directly into the server;

[00020] FIG. 2 is a perspective view of the server as disclosed which has been positioned at a server power station as disclosed;

[00021] FIG. 3 is a cross-sectional, side elevational view of the server taken along line 3-3 in FIG. 2;

[00022] FIG. 4 is a bottom plan view taken along line 4-4 in FIG. 2;

[00023] FIG. 5 is a perspective view of a rear surface of a server showing a server power contact positioned to show the relative placement thereof to a power station contact on the server power station;

[00024] FIG. 6 is an enlarged, top plan view of the server power contact engaged with the power station contact to provide electrical energy from the power station to the server to operate a heater positioned in the server;

[00025] FIG. 7 is an enlarged, partial fragmentary, cross-sectional side elevational view taken along line 7-7 in FIG. 6 showing the structure of the contact assembly;

[00026] FIG. 8 is a diagrammatic illustration of the circuit of the server power station and server;

[00027] FIG. 9 is a schematic of the circuit associated with the server to facilitate controlled energization of a heating element coupled to the server;

[00028] FIG. 10 is a diagram, similar to FIG. 8, of a preferred circuit of a brewer and server showing, among other things, a brewer control, a current sensing circuit and a server control;

[00029] FIG. 11 is a circuit diagram showing the current sensing circuit of FIG. 10 in more detail;

[00030] FIGS. 12A and 12B depict circuit diagrams which together depict the server control of FIG. 10 in more detail;

[00031] FIG. 13 is a circuit diagram showing the brewer control of FIG. 10 in more detail; and

[00032] FIGS. 14 and 15 show a sequence of current pulses sent by the current sensing circuit to the brewer control, which represents the status of level sensing performed by the brewer control.

DETAILED DESCRIPTION

[00033] While the present disclosure may be susceptible to embodiment in different forms, there is shown in the drawings, and herein will be described in detail, an embodiment with the understanding that the present description is to be considered an exemplification of the principles of the disclosure and is not intended to limit the disclosure to that as illustrated and described herein.

[00034] The present disclosure includes a beverage server 20, as described in greater detail hereinbelow either singularly or in combination with a brewer 22 as shown in FIG. 1, as well as a server power station 24 as shown in FIG. 2. The present disclosure also includes systems and structures which may used with a variety of servers 20.

[00035] As shown in FIG. 1, server 20 is positioned in brewer 22 so that a brewed beverage may be dispensed directly from a brewing funnel 26 through a brew-through lid 28 attached to the server 20 and into a reservoir 30 (see, FIG. 3) retained inside the server 20. The brew-through lid 28 is of a known construction as set forth in United States Patent Numbers 4,739,898, issued April 26, 1988 to Brown; and 5,480,054, issued January 2, 1996 to Midden, as incorporated herein by reference and assigned to the assignee of the present application. As shown in FIG. 1, the server 20 is positioned on a base 32 of the brewer 22. The base 32 is an unheated support to position the server 20 beneath the brewing funnel 26. As will be discussed in greater detail hereinbelow, the server 20 may be provided with a warming system which will maintain the temperature of the beverage retained in the reservoir 30 of the server 20 thereby eliminating the need for a warming element on the brewer 22.

[00036] With further reference to FIG. 2, the server 20 is shown positioned on the server power station 24. The provision of power from the server power station 24 will be described in detail hereinbelow. The server 20 as shown on the power station 24 is of the type as shown in FIG. 1 which includes the brew-through lid 28. It should be noted, however, that the server 20 also may be filled with a desired quantity of a desired beverage and a lid attached thereto. The server 20 does not require that a brew-through

lid 28 be used but it should be understood by one of ordinary skill in the art that a variety of lids may be used with a server in order to close a top filling mouth of the server. With reference to both FIGS. 1 and 2, the server 20 includes a faucet 34 positioned on a front surface thereof which is connected to a reservoir 30 (see, FIG. 3). A sight gauge 36 is also coupled to the faucet 34 for viewing the approximate level of the beverage in the reservoir.

[00037] Having now briefly described the overall external structures of the server 20, we turn to the internal structure and function of the server 20 as shown in FIGS. 3 and 4. As shown in FIG. 3, the reservoir 30 is retained within a housing 38. Insulation material 40 is positioned between an outside surface 42 of the reservoir 30 and an inside surface 44 of the housing 38. The insulation 40 as shown is a polyurethane expanded foam insulation, although one of ordinary skill in the art will be able to choose from a variety of insulation materials suitable for a desired set of conditions. Insulation 40 is positioned not only between the generally vertically aligned walls of the reservoir 30 and the housing 38 but also over a top surface 46 of the reservoir 30. Insulation 40 in the area above the reservoir 30 has a thickness dimension 48 which is generally greater than a thickness dimension 50 of the sidewalls. The offset of the top 46 from a top 52 of the housing allows a greater insulating effect to retain heat rising within the reservoir. As a result of the additional insulation thickness 48, heat is prevented from escaping and is retained within the beverage retained within the reservoir. It should be noted that thickness is used in the above description to describe heat retaining characteristics. If a thin high heat retention insulation is used above the reservoir, it may be thinner than a different insulation having a lower heat retention characteristic used in the walls.

[00038] As an additional way to prevent heat loss through heat conduction, the faucet 34, a connecting assembly of tubes 54 connecting the faucet 34 to the reservoir 30 and the sight gauge 36 all may be produced of a plastic material. The plastic material helps to further minimize the conduction of heat and temperature loss to the beverage retained therein. A faucet guard 56, which also serves as a carrying support, is attached to the housing 38 and not to the reservoir so as to further prevent conduction of heat from the reservoir through various structure associated with the server 20.

[00039] While insulation may be provided to cover a bottom portion 58 of the reservoir 30, in the embodiment as shown in FIG. 3, a heating assembly 60 as described in greater

detail hereinbelow, provides heat to the bottom 58. As such, insulation is generally not necessary although may be provided to further retain heat within the reservoir 30.

[00040] A fill tube 62 is attached to the brew-through lid 28. The fill tube 62 extends downwardly through the reservoir 30 so that beverage dispensed from a brewer through the lid 28 will be delivered in a lower portion 64 of the reservoir. By dispensing the beverage through the fill tube 62 into the lower portion 64, the addition of additional fresh beverage to the pre-existing beverage retained within the reservoir will be mixed with the existing beverage. By mixing newly added beverage with existing beverage, the flavors in the two beverages are forced to mix and are prevented from stratifying. Additionally, the fill tube 62 counteracts and prevents temperature stratification. Fresh heated beverage which is introduced into the reservoir may be at a slightly higher temperature than the beverage retained in the reservoir. The introduction of a higher temperature beverage in the lower portion 64 of the reservoir 30 forces mixing because the higher temperature beverage will tend to migrate upwardly towards an upper portion 66 of the reservoir 30. However, when the beverage is dispensed into the lower portion 64, it is required to mix with the existing beverage thereby preventing temperature stratification.

[00041] The present disclosure includes the heating assembly 60 which provides thermostatically controlled heat to the beverage retained in the reservoir 30. The heating assembly 60 is powered by a power delivery system 68 as shown diagrammatically in FIG. 8 and variously shown in terms of structures in FIGS. 2-7. The heating assembly 60 is coupled to and receives power from the server power station 24. It should be noted that the power delivery system 68 as diagrammatically shown in FIG. 8 and as more specifically shown in the server power station of FIGS. 2, 5-7, may also be provided in conjunction with the brewer 22 as shown in FIG. 1. The brewer 22 may be provided with the power delivery system 68 so that the server 20 is energized at the brewer 22. It should also be noted, that the power delivery system 68 as shown and described herein in greater detail can also be incorporated into a counter surface serving station and does not necessarily require the separate base structure 70 as shown in FIG. 2.

[00042] With the foregoing in mind, we now turn to FIGS. 3 and 4 to describe the heating assembly 60 disposed on the server 20. The heating assembly 60 includes a heating element or heating coil 72 which is attached to the bottom 58 of the reservoir 30. The heating coil 72 is in the form of a blanket heater of known construction. The heating coil 72 is positioned against the bottom 58 of the reservoir 30 so as to conduct heat through

the reservoir wall to the beverage retained therein. It is advantageous to position the heater 72 on the bottom so that the heat rises through the reservoir as a result of convective action. Additionally, the insulation material 40 in the side walls of the server 20 help to retain the heat within the beverage in the reservoir.

[00043] A control circuit 74 is provided to control the operation of the heater 72. The control circuit 74 is coupled to a thermostatic sensor or thermostat 76. The thermostatic sensor 76 is positioned on a side wall 78 of the reservoir 30, a dimension 80 above the bottom of the reservoir 30. In this regard, spacing of the thermostat 76 away from the bottom a distance 80 prevents sensing the heater 72. Rather, the thermostat 76 senses the temperature of the beverage retained in the reservoir which comes in contact with the side walls 78 thereby providing a more accurate reading of the contents of the reservoir. Spacing the thermostat 76 too far towards the top would prevent sensing the beverage temperature when the reservoir is depleted and also may result in an inaccurate and somewhat cooler or lower sensed temperature.

[00044] The thermostat 76 is coupled to the control circuit 74 via control line 82. When the beverage temperature drops below a predetermined preset level, the heater 72 is activated until the beverage temperature is raised to an upper value of a desired preset temperature range. It should be noted that the beverage temperature range may be programmed so that a desired beverage temperature may be maintained within the reservoir. When the reservoir is filled, heating of the beverage in the lower portion 64 tends to create convective currents within the beverage which tends to cause the beverage to migrate from the lower portion upwardly to the upper portion 66. As the beverage temperature decreases in the upper portion, the beverage tends to sink or migrate downwardly and once again be heated.

[00045] When the level of the beverage in the reservoir drops to the level generally only filling the lower portion 64, the upper portion 66 will be occupied by air. Even though the temperature of the air in the upper portion 66 may rise above the desired temperature range, the temperature of the beverage in the lower portion 64 will be maintained within the desired range as a result of positioning the thermostat 76 in the lower portion. Regulation of temperature using the thermostatic sensor 76 and the control circuit 74 prevent overheating of the reservoir even if the reservoir 30 is drained of beverage. In this regard, the thermostat 76 will continue to sense the temperature of the reservoir cavity which, under the present scenario, when the heater is activated, it will heat until the

upper level of the desired temperature range is achieved. Once achieved, the thermostat 76 will sense the temperature increase in the upper portion 66 and the control circuit 76 will deactivate the heater 72. As such, the heating assembly 60 of the present invention provides a fail safe mechanism which prevents overheating of the server 20.

[00046] The server 20 in conjunction with the heating assembly 60 as disclosed also acts to preheat the server 20. As discussed in the Background section, it is desirable to preheat a server 20 so that beverage placed in the reservoir 30 does not appreciably decrease in temperature. As such, an empty server 20 can be coupled to the power delivery system 68 for preheating the reservoir 30. If the reservoir 30 is empty, the air within the reservoir will be heated, which accordingly, will heat the structure of the reservoir and the surrounding insulation material. The preheating will prevent sinking of heat from a beverage subsequently deposited therein. As such, a server 20 can be preheated, filled with a beverage, and immediately placed for use without having to wait for the temperature of the beverage to rise to a desired serving temperature range after being deposited in the reservoir 30.

[00047] The power delivery system 68 as shown in FIG. 8 includes a contact assembly 84 which includes a server power contact 86 and a power station contact 88. The server power contact 86 and power station contact 88 are brought into engagement (see, FIGS. 6 and 7) to provide a conductive coupling to transmit power to the control circuit 74 and the heater 72.

[00048] In addition to controlling the temperature of the beverage in the reservoir 30, the control circuit 74 also includes a programmable timer for monitoring the time beverage is retained in the reservoir. When a server 20 is placed on a power station 24, the server power contact 86 is coupled to the power station contact 88 thereby resetting the timer within the control circuit 74. An indicator device 90 such as an LED is provided on the server 20. The indicator 90 is initially illuminated as a result of the coupling of the contacts 86, 88. After a predetermined, programmable "time-out", the indicator 90 will begin to flash. This will indicate that the serving life of the beverage retained in the reservoir has achieved its predetermined maximum. The flashing indicator 90 will signal to the food preparation employee that the beverage needs to be drained from the reservoir 30 and fresh beverage dispensed therein.

[00049] The circuit 74 can also be modified for use with the brewer 22 as shown in FIG. 1 such that a relay 91 is connected to the control circuit 74 and a start switch 93 of the

brewer 22. Once the start switch 93 is activated, it will momentarily break power to the control circuit 74 thereby resetting the timer. This type of circuit is useful when the server 20 is to be maintained at the brewer 22. In this regard, once the quantity of beverage in the reservoir 30 drops to a level where additional beverage is required, the brew or start switch 93 is activated to initiate a new brewing cycle thereby dispensing beverage through the filter 26 and lid 28, via the fill tube 62, into the reservoir 30. The activation of the start switch 93 will initiate the timer for a new period of time associated with the new quantity of beverage dispensed therein.

[00050] The control circuit 74 is shown herein in the form of a circuit board 95. A thermostat 76 is coupled to the circuit board via a line in the form of a ribbon cable 82. The power is provided from the server power contact 86 by the power lines 92, 94. The heater 72 is coupled to the circuit board by lines 96, 98 and the indicator 90 is coupled to the circuit board by lines 100, 102. Moveable mechanical jumpers 104 of a known construction are provided on the circuit board so as to program a desired hold time for retaining the beverage in the reservoir 30. The jumper connection 104 may be moved in order to achieve a desired hold time for the beverage. Alternatively, a lead may be provided on the circuit board for each of the desired hold times whereupon cutting and severing of the lead will produce the desired hold time-out period.

[00051] As briefly discussed herein and as shown in FIGS. 2-8, the present invention includes the power delivery system 68 in order to provide safe, control power to the server 20. It should be noted that the present discussion pertains to a two-station server and that other, multiples may be used as well as a single station server. The power delivery system 68 is generally shown in the diagram of FIG. 8. The power delivery system 68 is connected to a power source by way of a power source connection or plug 110. An incoming line 112 is connected to a corresponding transformer 116. The transformer 116 is provided to transform the incoming power to a lower voltage thereby making it safer for presentation to customers.

[00052] In particular, the transformer 116 of the preferred embodiment of the present invention brings the power down to 72 watts at 24 volts. This power level is considered safe to touch in accordance with Underwriter Laboratory standard maximum threshold of which is 42 volts. A manually resettable 4 amp circuit breaker 124 is provided on the line to prevent any potential problem in the event that the power station contact 88 is shorted.

[00053] A full wave bridge rectifier 126 is coupled to the line. As shown in FIG. 8, the diagrammatic view of the server 20 is positioned for coupling the server power contact 86 with the corresponding power station contact 88. When the contacts 86, 88 are coupled, power is provided to the heating assembly 60. The transformer 116 is retained in the base 70 of the server power station 24 or a base 32 of the brewer 22. Additionally, the transformer 116 and bridge 126 may also be retained in an equipment space provided in a permanent countertop-type installation.

[00054] Turning now to the structure and function of the contact assembly 84, it can be seen that the server contact 86 includes a pair of contact pads 130, 132 retained in an insulated protruding strip 134. The protruding strip 134 is positioned on a rear side 136 of the server 20 at a position for engagement with the power station contact 88. The power station 88 includes a pair of opposed side guides 138, 140. Inwardly of the side guides 138, 140 are positioned a pair of spring-loaded contact plungers 142, 144 which are positioned for conductive coupling with the contact pads 130, 132.

[00055] With reference to FIGS. 6 and 7, it can be seen that an inside surface 136 of the opposed side guides 138, 140 are spaced apart to permit passage of the protruding strip 134 therebetween. As shown in FIGS. 1 and 2, a pair of opposed guides 148, 150 and a front guide 152 are provided for positioning the server 20 relative to the power station contact 88. When positioned within the area defined by the side rails 148, 150, front guide 152 and power station contact 88, the server power contact 86 is directed into engagement with the power station contact 88. Sloped sides 154, 156 of the protruding strip 134 prevent the accumulation of food, dust and dirt on the server power contact 86 and promote engagement with the power station contact 88. The side guides 138, 140 protrude from a base portion 158 so as to shield the plungers 142, 144 and prevent contact with the surface 136 of the server housing 38. This is particularly desirable in the situation where the server housing 38 is formed of a metallic material. As such, the side guides 138, 140 prevent shorting of the plunger contacts 142, 144 against this surface.

[00056] With further reference to FIGS. 6 and 7, a partial fragmentary view of the plunger contact 142 is provided. As shown, an insulating body 160 is attached to the housing structure 161. A bore 162 is provided in the insulating body and a spring 164 is retained within the bore 162. The plunger includes a shaft portion 166 and a head portion 168. The head 168 has a greater diameter than the shaft 166 thereby retaining the spring 164 within the bore 162. Spring loading of the plunger contacts 142, 144 assures that there

will be a positive engagement against the contact pads 130, 132. Additionally, a waffled or raised surface 169 is provided on the face of the contact pads 130, 132. This also assures positive contact with the plunger head 168.

[00057] Turning now to FIG. 9, the schematic for the control circuit is reviewed. As shown, the control circuit 74 as shown in FIG. 9 includes the temperature sensor 76 coupled to the circuit board via lines 82. Lines 92, 94 connect the power station 24 to the server 20 at contact pads 132, 134. The heater 72 is coupled to lines 96, 98. The jumpers 104 are shown in greater detail in FIG. 9. The jumpers 104 include jumpers 170 for programming the hold time of the beverage in the reservoir 30 and jumpers 172 for programming the desired hold temperature. The control circuit includes a processor 174 connected to the jumpers 170, 172. Respective jumpers 170, 172 can be clipped to achieve the desired programming results. Alternatively, moveable mechanical jumper connectors may be used to achieve the desired programming results.

[00058] FIG. 10 is similar to FIG. 8, but shows a different version of the circuit. Because the circuit is so similar to that which is shown in FIG. 8, the same reference numerals are used to identify like parts, and a detailed description thereof is omitted for clarity. As shown in FIG. 10, the circuit includes a current sensing circuit 200 as well as a brewer control 202, both of which are preferably contained in the brewer 22 shown in FIG. 1. As will be described more fully later herein, the circuit shown in FIG. 10 is preferably configured such that a consumer is prevented from dispensing beverage from the server 20 unless the beverage is fresh (i.e., has not been sitting in the server 20 too long, or is within a pre-determined freshness period or "hold time"), beverage cannot be brewed and dispensed from the brewer 22 to the server 20 if a liquid level in the server 20 is above a pre-determined level, the brewer 22 automatically initiates a brewing cycle in response to pre-determined conditions, such as when beverage in the server 20 falls below a pre-determined level, and brewing is prevented if the server 20 is not in position relative to the brewer 22. Each of these conditions and/or features will be described more fully below with reference to FIGS. 10-15.

[00059] As shown in FIG. 10, preferably the server 20 is provided with an electrically operated solenoid dispense valve 204 (as opposed to a manually operated dispense valve (34) as shown in FIGS. 1-3). The valve 204 may be of any configuration for controllably dispensing beverage. As shown in FIG. 10, preferably a push-button dispense switch or valve control switch 206 is provided (ideally on the front of the server 20), and the push-

button dispense switch 206 is connected to the server control or server control circuitry 74A. The server control 74A is configured such that the dispense valve 204 is operated when the push-button dispense switch 206 is actuated, so long as the beverage has not been sitting in the server 20 too long, i.e. so long as the hold time has not expired (see the description above relating the hold time, indicator device 90, and jumpers 170, which applies equally to the corresponding parts which are shown in FIG. 12B). Preferably, the server 20 (and the server control 74A) is configured to provide that this feature is functional regardless of whether the server 20 is located on the brewer 20 (see FIG. 1) or on a remote serving stand 24 (see FIG. 2).

[00060] A level sensor 210 is provided to determine the condition of the level of beverage in the server 20. The level sensor 210 may be in any configuration which senses a range of levels or a single level in the server 20. As shown in FIG. 10, preferably a level sensing probe 210 is provided in the server 20. It should be noted, however, that the level sensor is not limited to a conductive probe and may instead be a sonic, optical, or other level sensor coupled to the server control 74A. As shown, the probe 210 may be located in an outlet pipe 212 which feeds the dispense valve 204. In such case, the probe 210 will be dry only when the server 20 is completely empty. Alternatively, the probe 210 may be disposed at some other level in the server 20, such as in the tank 30, the sight gauge 36 or connecting tubes 54 (see FIGURES 1-3 which show the sight gauge 36 and tubes 54), wherein the probe 210 will be dry should the liquid level in the server 20 fall below the level at which the probe 210 is disposed.

[00061] The level sensing probe 210 is connected to the server control 74A, and the server control 74A uses the level sensing probe 210 to determine whether the probe 210 is in contact or not contacting beverage. Subsequently, the server control 74A sends this information to the brewer 22 (via the contact assembly 84), and more specifically to the current sensing circuit 200 and brewer control 202. Preferably, the brewer 22 and server 20 (i.e. the brewer control 202, current sensing circuit 200 and server control 74A) are configured such that this information can be communicated from the server 20 to the brewer 22 without any additional electrical contacts being provided between the brewer 22 and server 20 other than the contact assemblies 84, which have been described hereinabove. Preferably, the brewer control 202 is configured such that if it is detected that the probe 210 is wet, the brewer 22 cannot be directed (i.e., by pressing start switch 93 -- see FIGS. 1 and 13) to brew beverage and dispense the beverage into the server 20

until the beverage in the server 20 is drained (or at least until the liquid level in the server 20 drops below the probe 210). This prevents fresh beverage from being mixed with old beverage in the server 20 and/or prevents overflow of the server 20. Preferably, the brewer control 202 is configured to automatically initiate a brewing cycle and dispense brewed beverage into the server 20 if it is detected that the probe 210 is dry. Preferably, the brewer control 202 is configured to detect whether a server 20 is engaged with the brewer 22, and the brewer 22 will not attempt to dispense beverage unless a server 20 is detected.

[00062] Preferably, the server control 74A regulates the temperature of the beverage stored in the server 20 by pulsing the current to the heater 72. The current sensing circuit 200 sends a signal to the brewer control 202 that is representative of the current flow to the server 20. Preferably, the brewer control 202 is programmed to recognize a unique current pulse characteristic generated by the server control 74A to represent the status of the level sensing probe 210 (i.e., whether the probe 210 is conducting or non-conducting). Preferably, the unique pulse characteristic is generated in a short time (relative to the thermal response time of the server 20 and its contents). Because the unique pulse characteristic is generated in a short time, there is no substantial effect on the temperature regulation performed by the server control 74A. If the server 20 is not present (i.e., is not electrically connected via the contacts 84), the current sensing circuit 200 will detect no current, and the brewer control 202 prevents initiation of a brewing cycle.

[00063] FIG. 11 is a circuit diagram showing the current sensing circuit 200 of FIG. 10 in more detail. As shown, the current sensing circuit 200 is connected to transformer 116, full wave bridge 126, contacts 88 and to the brewer control 202. Preferably, the current sensing circuit is mounted on a board.

[00064] FIGS. 12A and 12B depict circuit diagrams which together depict the server control 74A of FIG. 10 in more detail. As shown, FIG. 12B is similar to that which is shown in FIG. 9, and like the circuit shown in FIG. 9, the circuit shown in FIG. 12 B includes a thermostat 76A, control line 82A, indicator device 90A, power lines 92A, 94A, lines 96A, 98A, jumpers 104A, 170A, 172A, a contact pad 132A and a processor 174A.

[00065] FIG. 13 is a circuit diagram showing the brewer control 202 of FIG. 10 in more detail. As shown, the brewer control 202 includes a switch 214 which can be closed to provide that the brewer control 202 will automatically start a brewing cycle when the level sensor 210 of the server senses no beverage.

[00066] FIGS. 14 and 15 show a sequence of current pulses sent by the current sensing circuit 200 to the brewer control 202, which represents the status of level sensing performed by the brewer control 202. Specifically, FIG. 14 depicts a "server present signal" the purpose of which is so that if the heater is off (and therefore no server heat is required) and the hold time has not expired, the brewer control 202 will still receive a signal and the brewer 22 will not mistakenly conclude that the server 20 is not present. FIG. 15 depicts a "server empty signal" which is provided when the probe 210 in the server 20 is not contacting beverage or establishing a circuit. As shown, the bit pattern is generally non-uniform. If the timer (i.e. the brewer control 202) detects no server signal for more than 2.13 seconds, the brewing cycle is terminated. While FIGS. 14 and 15 show two possible pulse patterns which can be employed, other pulse patterns can be used to provide communication between the server and the brewer.

[00067] The system shown in FIG. 10 (and FIGS. 11-15) provides a highly automated brewing system wherein beverage in a server is retained at a desired heated temperature, beverage in a server is dispensed only if the beverage is fresh (i.e. has not been sitting in the server too long), fresh beverage is prevented from being mixed with out of date beverage in a server, overflow of the server is prevented, beverage is automatically brewed and dispensed into a server if a liquid level in the server falls below a pre-determined level, and beverage is prevented from being brewed and dispensed from a brewer unless a server is in position with respect to the brewer. Other information can also be sent via the pulse stream, i.e. the server capacity can be sent to the brewer control 202 so the correct amount of beverage is brewed.

[00068] While embodiments of the disclosure are shown and described, it is envisioned that those skilled in the art may devise various modifications and equivalents without departing from the spirit and scope of the disclosure. The disclosure is not intended to be limited by the foregoing detailed description.